

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Shigehiro MATSUNO *et al.* Confirmation No. 6444
Serial No. : 10/591,044
Filed : August 29, 2006
For : REGENERATION CONTROLLER FOR EXHAUST
PURIFYING APPARATUS OF INTERNAL COMBUSTION
ENGINE
Group Art Unit : 3748
Examiner : Loren C. EDWARDS

MAIL STOP AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

RESPONSE TO AUGUST 27, 2008 OFFICE ACTION

SIR:

In response to the non-final Office Action mailed August 27, 2008 in the above-identified application, the Applicant respectfully submits the following.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 13 of this paper.

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine, wherein the exhaust purification apparatus includes an upstream purification portion and a downstream purification portion, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure, between a first location upstream from the exhaust purification apparatus and a second location downstream from the exhaust purification apparatus, and a difference in exhaust temperature, between a third location upstream from the downstream purification portion of the exhaust purification apparatus and a fourth location downstream from the third location;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the fourth location and an air intake amount;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a replacement control section for replacing the estimated accumulation amount with a greater estimated accumulation amount when the estimated accumulation amount falls within a replacement determination reference range due to the heating and the at least one difference is greater than a replacement reference value.

2. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine, wherein the exhaust purification apparatus includes an upstream purification mechanism and a

downstream purification mechanism that are arranged in the exhaust passage, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure and a difference in exhaust temperature between an upstream location and a downstream location of the downstream purification mechanism;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the downstream location of the downstream purification mechanism;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a replacement control section for replacing the estimated accumulation amount with a greater estimated accumulation amount when the estimated accumulation amount falls within a replacement determination reference range due to the heating and the at least one difference is greater than a replacement reference value.

3. (Previously Presented) The regeneration controller according to claim 1, wherein the replacement determination reference range includes a value equal to the accumulation amount of particulate matter in the exhaust purification apparatus immediately before the heating is completed.

4. (Previously Presented) The regeneration controller according to claim 1, wherein a maximum value of the replacement determination reference range is equal to the accumulation amount of particulate matter in the exhaust purification apparatus when the heating is completed.

5. (Previously Presented) The regeneration controller according to claim 1, wherein when an estimated accumulation amount obtained by calculation that is resumed, using the replaced estimated accumulation amount, falls within the replacement determination reference

range again and the at least one difference is greater than the replacement reference value, the replacement control section repeats the replacement of the estimated accumulation amount.

6. (Original) The regeneration controller according to claim 5, wherein when a state in which the at least one difference is greater than the replacement reference value continues and the number of times the estimated accumulation amount is replaced reaches a stop determination number, the replacement control section refrains from executing the replacement of the estimated accumulation amount until the presently performed heating is completed.

7. (Original) The regeneration controller according to claim 6, further comprising: a correction control section for correcting the replacement reference value to generate a corrected reference value that is used for subsequent heating when a state in which the difference in exhaust pressure is greater than the replacement reference value continues and the number of times the estimated accumulation amount is replaced reaches the stop determination number.

8. (Original) The regeneration controller according to claim 7, wherein the correction control section increases the replacement reference value based on the value of the difference in the exhaust pressure when the number of times the estimated accumulation amount is replaced reaches the stop determination number.

9. (Previously Presented) The regeneration controller according to claim 2, wherein the regeneration controller is provided with a sulfur elimination mode for restoring the exhaust purification apparatus from sulfur poisoning by releasing sulfur components from the exhaust purification apparatus, and the replacement control section refrains from replacing the estimated accumulation amount when the regeneration controller is in the sulfur elimination mode or when the sulfur elimination mode is requested.

10. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine,

wherein the exhaust purification apparatus includes an upstream purification portion and a downstream purification portion, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure, between a first location upstream from the exhaust purification apparatus and a second location downstream from the exhaust purification apparatus, and a difference in exhaust temperature, between a third location upstream from the downstream purification portion of the exhaust purification apparatus and a fourth location downstream from the third location;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the fourth location and an air intake amount;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a hold control section for holding the estimated accumulation amount when the estimated accumulation amount falls within a hold determination reference range due to the heating and the at least one difference is greater than a held reference value.

11. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine, wherein the exhaust purification apparatus includes an upstream purification mechanism and a downstream purification mechanism that are arranged continuously in the exhaust passage, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure and a difference in exhaust temperature between an upstream location and a downstream location of the downstream purification mechanism;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the downstream location of the downstream purification mechanism;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a hold control section for holding the estimated accumulation amount when the estimated accumulation amount falls within a hold determination reference range due to the heating and the at least one difference is greater than a held reference value.

12. (Previously Presented) The regeneration controller according to claim 10, wherein the hold determination reference range includes a value equal to the accumulation amount of particulate matter in the exhaust purification apparatus immediately before the heating is completed.

13. (Previously Presented) The regeneration controller according to claim 10, wherein when a state in which the at least one difference is greater than the held reference value continues and a period in which the estimated accumulation amount is held reaches a stop determination period, the hold control section does not further hold the estimated accumulation amount.

14. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine, wherein the exhaust purification apparatus includes an upstream purification portion and a downstream purification portion, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure, between a first location upstream from the exhaust purification apparatus and a second location downstream from the exhaust purification apparatus, and a difference in exhaust temperature, between a third location upstream from the downstream purification portion of the exhaust purification apparatus and a fourth location downstream from the third location;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of

particular matter is calculated using at least an exhaust temperature taken at the fourth location and an air intake amount;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a particulate matter elimination continuation control section for continuing the heating until the at least one difference is reduced to be smaller than a continuance reference value when the estimated accumulation amount reaches a reference value for completing the heating and the at least one difference is greater than the continuance reference value.

15. (Currently Amended) A regeneration controller for regenerating an exhaust purification apparatus that is arranged in an exhaust passage for an internal combustion engine, wherein the exhaust purification apparatus includes an upstream purification mechanism and a downstream purification mechanism that are arranged continuously in the exhaust passage, the regeneration controller comprising:

a difference detector for detecting at least one of a difference in exhaust pressure and a difference in exhaust temperature between an upstream location and a downstream location of the downstream purification mechanism;

a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the downstream location of the downstream purification mechanism;

a heating control section for heating the exhaust purification apparatus to eliminate the particulate matter from the exhaust purification apparatus when the estimated accumulation amount is greater than a reference accumulation amount; and

a particulate matter elimination continuation control section for continuing the heating until the at least one difference is reduced to be smaller than a continuance reference value when the estimated accumulation amount reaches a reference value for completing the heating and the at least one difference is greater than the continuance reference value.

16. (Previously Presented) The regeneration controller according to claim 14, wherein when a state in which the at least one difference is greater than the continuation reference value continues and a period in which the heating is continued reaches a stop determination period, the particulate matter elimination continuation control section stops the heating.

17. (Previously Presented) The regeneration controller according to claim 14, wherein the exhaust purification apparatus is a catalytic converter including a base coated with a layer of NO_x storage reduction catalyst, the base being formed to filter particulate matter contained in exhaust.

18. (Previously Presented) The regeneration controller according to claim 14, wherein the exhaust purification apparatus includes:

a NO_x storage reduction catalyst device; and
a filter, arranged downstream from the NO_x storage reduction catalyst device and having a layer of NO_x storage reduction catalyst, for filtering particulate matter contained in exhaust.

19. (Previously Presented) The regeneration controller according to claim 14, wherein the third location is located in the exhaust purification apparatus, and the fourth location is downstream from the exhaust purification apparatus.

20. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the replacement control section according to claim 1.

21. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the hold control section according to claim 10.

22. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the continuation control section according to claim 14.

23. (Previously Presented) The regeneration controller according to claim 1, wherein the exhaust purification apparatus is a catalytic converter including a base coated with a layer of NOx storage reduction catalyst, the base being formed to filter particulate matter contained in exhaust.

24. (Previously Presented) The regeneration controller according to claim 1, wherein the exhaust purification apparatus includes:

a NOx storage reduction catalyst device; and

a filter, arranged downstream from the NOx storage reduction catalyst device and having a layer of NOx storage reduction catalyst, for filtering particulate matter contained in exhaust.

25. (Previously Presented) The regeneration controller according to claim 1, wherein the third location is located in the exhaust purification apparatus, and the fourth location is downstream from the exhaust purification apparatus.

26. (Previously Presented) The regeneration controller according to claim 2, wherein the replacement determination reference range includes a value equal to the accumulation amount of particulate matter in the exhaust purification apparatus immediately before the heating is completed.

27. (Previously Presented) The regeneration controller according to claim 2, wherein a maximum value of the replacement determination reference range is equal to the accumulation amount of particulate matter in the exhaust purification apparatus when the heating is completed.

28. (Previously Presented) The regeneration controller according to claim 2, wherein when an estimated accumulation amount obtained by calculation that is resumed, using the replaced estimated accumulation amount, falls within the replacement determination reference range again and the at least one difference is greater than the replacement reference value, the replacement control section repeats the replacement of the estimated accumulation amount.

29. (Previously Presented) The regeneration controller according to claim 28, wherein when a state in which the at least one difference is greater than the replacement reference value continues and the number of times the estimated accumulation amount is replaced reaches a stop determination number, the replacement control section refrains from executing the replacement of the estimated accumulation amount until the presently performed heating is completed.

30. (Previously Presented) The regeneration controller according to claim 29, further comprising:

a correction control section for correcting the replacement reference value to generate a corrected reference value that is used for subsequent heating when a state in which the difference in exhaust pressure is greater than the replacement reference value continues and the number of times the estimated accumulation amount is replaced reaches the stop determination number.

31. (Previously Presented) The regeneration controller according to claim 30, wherein the correction control section increases the replacement reference value based on the value of the difference in the exhaust pressure when the number of times the estimated accumulation amount is replaced reaches the stop determination number.

32. (Previously Presented) The regeneration controller according to claim 2, wherein the regeneration controller is provided with a sulfur elimination mode for restoring the exhaust purification apparatus from sulfur poisoning by releasing sulfur components from the exhaust purification apparatus, and the replacement control section refrains from replacing the estimated accumulation amount when the regeneration controller is in the sulfur elimination mode or when the sulfur elimination mode is requested.

33. (Previously Presented) The regeneration controller according to claim 2, wherein the exhaust purification apparatus is a catalytic converter including a base coated with a layer of NO_x storage reduction catalyst, the base being formed to filter particulate matter contained in exhaust.

34. (Previously Presented) The regeneration controller according to claim 2, wherein the exhaust purification apparatus includes:

a NOx storage reduction catalyst device; and

a filter, arranged downstream from the NOx storage reduction catalyst device and having a layer of NOx storage reduction catalyst, for filtering particulate matter contained in exhaust.

35. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the replacement control section according to claim 2.

36. (Previously Presented) The regeneration controller according to claim 10, wherein the third location is located in the exhaust purification apparatus, and the fourth location is downstream from the exhaust purification apparatus.

37. (Previously Presented) The regeneration controller according to claim 11, wherein the hold determination reference range includes a value equal to the accumulation amount of particulate matter in the exhaust purification apparatus immediately before the heating is completed.

38. (Previously Presented) The regeneration controller according to claim 11, wherein when a state in which the at least one difference is greater than the held reference value continues and a period in which the estimated accumulation amount is held reaches a stop determination period, the hold control section does not further hold the estimated accumulation amount.

39. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the hold control section according to claim 11.

40. (Previously Presented) The regeneration controller according to claim 15, wherein when a state in which the at least one difference is greater than the continuation

reference value continues and a period in which the heating is continued reaches a stop determination period, the particulate matter elimination continuation control section stops the heating.

41. (Previously Presented) The regeneration controller according to claim 15, wherein the exhaust purification apparatus is a catalytic converter including a base coated with a layer of NO_x storage reduction catalyst, the base being formed to filter particulate matter contained in exhaust.

42. (Previously Presented) The regeneration controller according to claim 15, wherein the exhaust purification apparatus includes:

a NO_x storage reduction catalyst device; and

a filter, arranged downstream from the NO_x storage reduction catalyst device and having a layer of NO_x storage reduction catalyst, for filtering particulate matter contained in exhaust.

43. (Previously Presented) An electronic control unit serving as the calculation section, the heating control section, and the continuation control section according to claim 15.

REMARKS

I. Status of Claims

Claims 1-43 are pending in the application. Claims 1, 2, 10, 11, 14, and 15 are independent. Claims 1, 2, 10, 11, 14, and 15 are currently amended. Support for the additional language of these claims can at least be found in paragraph [0046] of the Applicant's specification as published.

Claims 1-4, 10-12, 14, 15, 20-22, 26, 27, 35, 37, 39, and 43 are rejected under 35 U.S.C. 102(b) as allegedly being clearly anticipated by Ono et al. (USP 6,438,948) (hereinafter "Ono").

Claims 17, 18, 23, 24, 33, 34, 41, and 42 are rejected under 35 U.S.C. 103(a) as allegedly being unpatentable over Ono in view of Deeba (USP 6,912,847) (hereinafter "Deeba").

The Applicant respectfully requests reconsideration of these rejections in view of the foregoing amendments and the following remarks.

II. Allowable Subject Matter

Claims 5-9, 13, 16, 19, 25, 28-32, 36, 38, and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

III. Pending Claims

Independent claims 1, 2, 10, 11, 14, and 15 are rejected under 35 U.S.C. 102(b) as allegedly being clearly anticipated by Ono.

The Applicant respectfully submit that claims 1, 10, and 14 are patentable over Ono at least because they recite, *inter alia*, "...a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the fourth location and an air intake amount...." (emphasis added)

The Applicant respectfully submit that claims 2, 11, and 15 are patentable over Ono at least because they recite, *inter alia*, “...a calculation section for calculating an estimated accumulation amount of particulate matter in the exhaust purification apparatus, wherein the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature taken at the downstream location of the downstream purification mechanism...” (emphasis added)

The Applicant respectfully submits that a key distinction between the inventions of claims 1, 2, 10, 11, 14, and 15 and Ono is that the controller described in Ono lies in the calculation of an estimated accumulation amount of particulate matter. In Ono, the accumulation amount of particular matter is calculated “on the basis of [the] amount of fresh air detected.” (See Ono, claim 1.) However, in paragraph [0046] of the present application as published, it is stated that the accumulation amount may be determined based on the air intake temperature (GA) and the exhaust temperature (tcho). (See paragraph [0046] and FIG. 1 of the present application as published). It is respectfully submitted that Ono does not describe determining the accumulation amount in such a manner. To clarify this distinction, the independent claims now recite that the estimated accumulation amount of particular matter is calculated using at least an exhaust temperature that is taken at the downstream location of the downstream purification mechanism or that is taken at the fourth location and an air intake amount. Thus, since Ono does not describe each and every limitation of the inventions of claims 1, 2, 10, 11, 14, and 15, the Applicant respectfully submits that Ono does anticipate the Applicant’s claims as alleged.

Further, the Applicant respectfully submits that none of the other references cited identify a reason for modifying Ono in the manner as claimed by the Applicant in the inventions claims 1, 2, 10, 11, 14, and 15. The Applicant respectfully submits that, as discussed in *KSR Int'l Co. v. Teleflex, et al.*, No. 04-1350, (U.S. Apr. 30, 2007), it remains necessary to identify the reason why a person of ordinary skill in the art would have been prompted to combine alleged prior art elements in the manner as claimed by the Applicant. Accordingly, claims 1, 2, 10, 11, 14, and 15 are not rendered obvious by Ono in view of the cited references under §103.

Therefore, for at least these reasons, the Applicant respectfully submits that claims 1, 2, 10, 11, 14, and 15, as well as their dependent claims, are patentable over the cited references.

IV. Conclusion

For the above reasons, the Applicant respectfully submits that this application is in condition for allowance. Prompt consideration and allowance are solicited. The Examiner is encouraged to contact the undersigned with any questions.

The Office is authorized to charge any additional fees under 37 C.F.R. § 1.16, § 1.17, or § 1.136, or credit of any overpayment, to Kenyon & Kenyon Deposit Account No. 11-0600.

Respectfully submitted,

Dated: November 25, 2008

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